

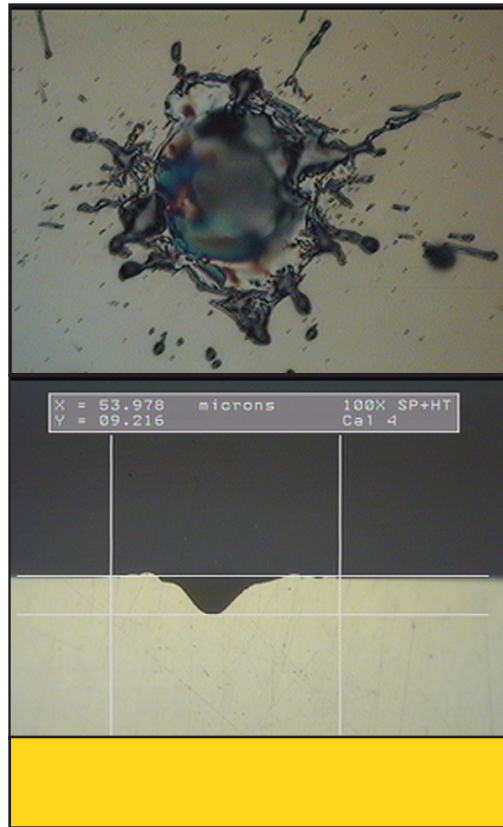


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Science and Technology for Tomorrow's Aerospace Forces

Success Story

LASER DAMAGE STUDIES ON FOCAL PLANE ARRAYS



Currently, the Directed Energy Directorate is developing a wide variety of military systems containing optical components and detector elements critical to their function. Concern about our ability to protect our assets from foreign, and sometimes our own, infrared (IR)-seeking missiles led to a need for a better understanding of the laser damage processes. Several mechanisms dependent on a variety of laser parameters produce laser damage. Wavelength, which determines if the material is transparent or absorptive to the radiation, and pulse duration, which determines the primary mechanism for the onset of damage, are among the variables investigated.



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Accomplishment

Directorate researchers recently performed a detailed study of laser damage to IR detector material and focal plane arrays (FPAs). Experimental results using a variable pulse format Nd:YAG (1.064 μm) laser to damage silicon, platinum silicon, and indium antimony FPAs elucidate damage as a function of energy.

Researchers also demonstrated the improved effectiveness of multiple pulses compared to single pulses on IR detectors. They discovered that the first pulse of a multiple pulse needs a less amount of the fluence compared to a single pulse laser. This discovery significantly impacts the requirements for lasers to defeat FPA-based IR seeker threats, ultimately resulting in smaller, lighter, and lower-cost countermeasure systems.

Background

Determining the optimum damage mechanism to defeat FPA-based missiles is critical in establishing future IR countermeasure (IRCM) techniques and designing IRCM systems. The directorate is conducting extensive research to determine the optimum laser pulse format for causing catastrophic damage to FPAs. Directorate researchers conducted the study to determine functional dependence of IR detectors on pulsewidth and the effect of single- and multi-shot laser formats.

Directed Energy
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Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTT, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (01-DE-14)